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August 12, 2016

Jennifer LaPoma
U.S. Environmental Protection Agency, Region II
290 Broadway
New York, New York 10007-1866

Via Electronic Mail

**Re: 17-Mile Lower Passaic River Study Area (LPRSA) June 2016 Meeting Summaries -
Administrative Agreement and Order on Consent for Remedial
Investigation/Feasibility Study - CERCLA Docket No. 02-2007-2009**

Dear Ms. LaPoma:

The LPRSA Cooperating Parties Group (CPG) writes in response to the USEPA Region 2's (Region) comments on the CPG's June 16, June 28 and June 29 17-mile RI and LPRSA Modeling comment meeting summaries provided by the Region to the CPG on July 14 and 26, 2016.

Although the original CPG meeting summaries are accurate and fully reflect the discussions that occurred and the proposed action items that were identified, the CPG agrees to undertake the Region's additions and modifications to the proposed actions items in revising the 17-mile RI and LPRSA models.

The CPG will deliver its response to comments to the Region's RI comments by September 13 as directed in the Region's July 14 email. The due date for CPG's response to comments on the Region's LPRSA Modeling comments has yet to be determined.

The CPG requests that this letter and the Region's redline versions of the meeting summaries (attached) be included in both the Administrative Records for the 17-mile LPRSA operable unit of the Diamond Alkali Superfund Site and the 8-mile Record of Decision.

J. LaPoma
June 2016 RI & LPRSA Meeting Summaries
August XX, 2016
Page 2 of 2

If you have any questions, please contact Bill Potter or me.

Very Truly Yours,
de maximis, inc.



Robert Law, Ph.D.
CPG Project Coordinator

Attachments

cc:

Michael Sivak, USEPA Region 2
Frances Zizila, USEPA Region 2
CPG Members
William Hyatt, CPG Coordinating Counsel
Willard Potter, de maximis, inc.

Meeting Notes
17-mile RI Comment Review Meeting
June 16, 2016
10:00 AM to 2:00 PM

Participants

Region 2 (R2)

Jennifer LaPoma
Ed Garland (HDR)
James Wands (HDR)
Scott Kirchner (CDM)
Keegan Roberts (CDM)
Aaron Frantz (CDM)

CPG

John Connolly (AQEA)
Jim Quadrini (AQEA)
Raghav Narayanan (AQEA)
Rob Law (de maximis)
Peter Israelsson (AQEA) – by phone
Mike Barbara (mab) – by phone

Opening Remarks – CPG representatives stated that there were several instances where the Region's comments called for revisions and additional work that was inconsistent with the work and level of effort conducted by the Region in its 8-mile ROD and associated FFS-RI. We also stated that there were comments that called for revisions and additional work that are not part of a typical CERCLA RI.

After opening remarks, attention was directed toward discussing specific groups of comments.

- **Subsurface contamination (comments 109b, 109d, 110)**

- R2 is interested in understanding contamination as it relates to surface vs. subsurface, fine grained vs. coarse grained sediments, erosional vs. depositional areas, etc.
- R2 is OK with a discussion of subsurface contamination that has a similar level of detail to that in the FFS RI Report
 - Good examples are FFS RI Figure 4-67 and 4-68
 - Refer to R2 (J. LaPoma) email of 5/26 for additional information
- **Proposed Action:** CPG will revise the subsurface contamination discussion to be comparable to that in the FFS RI Report, including discussion of contamination by deposit and presentation of downcore profiles by river segment
 - The discussion described above will address the R2 comment regarding Core 0555

- **Characteristics and fate/transport of tributaries (comments 139, 192)**

- R2 is interested in more detailed discussion of nature of contamination in the tributaries, recognizing we may not be able to say anything about extent (R2 will likely identify this as data gap)
- A few ways to address this desire were discussed, including

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- For each tributary, compare sediment type and chemistry in samples collected above the head-of-tide (HOT), [below](#) the HOT ([but within the tributary](#)), and immediate LPR proper
- Present spatial distribution of sediment type and chemistry for each tributary
- For Figure 4-13a, for example, use different symbols to differentiate samples collected above the HOT and within the HOT

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- **Proposed Action:** CPG to develop/revise figures listed above and add discussion to the report regarding nature of contamination in each tributary (i.e., discuss whether tributaries are possible source to LPR, potential influences of LPR on tributary sediments within the HOT, etc.)

- **CWCM data interpretation (comments 206, 211b, 342)**

- R2 is interested in seeing more detailed presentations of sv-CWCM data to help inform more complete understanding of the “basic data” (e.g., differences between tidal phases, differences with depth and salinity, differences between stations and events, etc.) beyond the aggregated (“rolled up”) metrics presented in the CPG RI Report.
 - Existing metrics should be disaggregated further (e.g., Figure [6-4](#) on an event-specific and surface vs bottom basis; Appendix H Figure 1-1 on an event-specific basis), and additional metrics should be added (e.g., paired data evaluations).
 - If analyzing the data on a more disaggregated basis does not provide insight on transport due to sparse data density, that point should be made in the report before presenting aggregated presentations of the data
 - R2 was in principle amenable to limiting the more detailed metrics to one or two COPCs, to make the report discussion/presentation tractable.
- R2 clarified that the additional metrics suggested in its comments were geared towards better understanding the data (as opposed to evaluating model performance), including the range of the concentrations and any differences noted between tidal cycles. [While an analysis of the data at the resolution of individual data points will be sufficient for Section 6 and Appendix H, it is anticipated that model data comparisons will also be presented at that same resolution in the discussion of the model calibration and in particular the calibration of the fluff layer.](#)
- **Proposed Action:** CPG will generate additional data evaluations to determine whether the results help better evaluate transport processes, and include a more detailed presentation for one or two COPCs in the revised report.

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- **Proposed Action:** R2 will review comments 186, 197 and 198 to understand if they are geared towards data evaluation or modeling

- **Upstream transport (comment 113)**

- R2 indicated it does not like the call-out boxes at the front of each section and asked to have them deleted from the revised report. If the CPG retains them the Region expects that it will comment and heavily edit them or completely strike them from the report.
- A discussion was held about the language proposed by the CPG and the language proposed in the R2 comment regarding transport to (or above) RM14.
- **Proposed Action:** CPG will assess deleting the call-out boxes.
- **Proposed Action:** CPG will modify text to indicate something like "in principle, transport can occur upstream to the Dundee Dam, however hydrodynamic model results and sediment concentration gradients in contaminants such as 2,3,7,8-TCDD suggest that only limited upstream transport may occur beyond approximately RM 14."
- Comment 213 was also discussed. The performance of model simulation with historical bathymetry in both the LPR and Newark Bay will be evaluated to support the statement that historically the salt front could have moved further upstream than it does today. R2 expressed concern that the evaluations of Chant et al. (2010) and Canizares et al. (2009) do not adequately account for Newark Bay bathymetry changes.
- **Proposed Action:** CPG will either delete the statement or provide additional support for it (e.g., model simulation). CPG will discuss this further.

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- **Work beyond typically Included in an RI (comments 57, 104, 107)**

- Comment 57: R2 indicated the comment was made on the RI. Subsequently, in response to the CPG inquiring about the RI comment, R2 verified the comment within the RI. Also, in response to the inquiry, Side Scan Sonar results were checked in the FS and references to the survey were found with other data sets stated to be collected during the RI. (Post June 16 meeting note - references are in FS Section 1.3). In the meeting, the CPG commented that the Side Scan Sonar work was not done in the RI.
- R2 rescinded the request for details and figures related to debris in the revised RI Report, but asked that we simply add one paragraph that indicates that a Side Scan Sonar (SSS) survey was done and debris was identified, and then reference the report – R2 suggested using the discussion in the Portland Harbor RI Report as an example.
- **Proposed Action:** CPG will review the SSS, review the DQOs of the survey, and determine what text we can add to the revised RI Report (along the lines of the one paragraph described in the bullet above)

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- Comment 104: **Action:** R2 agreed to omit this comment
- Comment 107: CPG agreed the requested figure modification was simple
- **Proposed Action:** CPG will revise Figure 3-15 to differentiate samples collected in different geomorphic features (and left bank vs right bank)

- **Additional Discussion**

- **Action:** A discussion was held about General Comment 1. R2 stated the purpose of General Comment 1 is to highlight the need to replace these qualitative terms with quantitative terms. Also, the Region stated specific comments relating to the replacements are found in the comment set (e.g., Comments 12 and 22).
- **Action:** CPG will add table to the BERA that compares sediment contaminant concentrations to various SQGs (per Comment 109c). Any new chemicals that screen through the process will be discussed in the main body of the RI Report.
- **Action:** CPG will review the report and make sure recurrence interval for Hurricane Irene is consistently reported as 1-in-90 year event (per USGS determination)
- **Action:** R2 asked the CPG to add the 2008 bathymetry in the bathymetric difference analysis/maps, but caveat the discussion and figures with the uncertainty surrounding the datum (per Comment 99)

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Meeting Summary
17-mile RI/FS Modeling Meeting
June 28, 2016
10:00 AM to 2:30 PM

Participants

Region 2 (R2)

Jennifer LaPoma
Eugenia Naranjo
Michael Sivak
Ed Garland (HDR)
James Wands (HDR)
Scott Kirchner (CDM)
Aaron Frantz (CDM)
Jonathan Clough (Warren-Pinnacle) – by phone

CPG

Rob Law (de maximis)
John Connolly (AQEA)
Peter Israelsson (AQEA)
Pete Oates (AQEA)
Wen Ku (AQEA)
Mathew Rooni (M&N)
John Toll (WW)

Introductions/Opening Remarks: There were no opening remarks; group proceeded directly to the modeling topics on the agenda.

- **COPCs for which the Chemical Fate & Transport (CFT) model will be calibrated (EPA Comment 372)**
 - CPG communicated its strong desire to reduce the number of Chemical of Potential Concerns (COPCs) to a more tractable number than the 29 Dioxin/Furan congeners required by R2, based on several considerations:
 - The level of effort.
 - COPCs not driving risk are not needed for remedial decision-making.
 - Some COPCs are poor candidates for calibration because of (a) many non-detect samples in the water column dataset, and/or (b) strong influences from poorly quantified regional background sources.
 - R2's objective to cover a wider range of partitioning behaviors can be achieved by a small subset of R2's COPC list.
 - R2 explained that CPG can calibrate a small set of COPCs and test the others as a validation exercise, per R2's approach in the FFS/ROD model.
 - R2 expressed concern that not simulating all 29 COPCs may limit future risk assessment for the LPR RI/FS and also for the NBSA RI/FS.
 - CPG asked for R2 to identify a risk threshold to use in reducing the modeled COPCs list and for R2 to clarify which additional COPCs would be required for NBSA needs.
 - R2 agreed that a Theissen polygon based mapping could be used for COPCs not needed for remedial benefit evaluation, so as to reduce the level of effort.
 - **Proposed Action:**
 - CPG will provide R2 a table containing chemical properties, estimated risk, availability of [a](#) high volume chemical water column (hv-CWCM

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data) (for partitioning settings), [b\) literature values of partitioning parameters \$f_E\$ and \$K_{oc}\$](#) , and [c\) small volume \(sv\)-CWCM data](#) (for calibration) for the 48 COPCs in the EPA FFS/ROD model. CPG will highlight COPCs it proposes for calibration and specify the type of mapping to perform (conditional simulation vs Theissen polygons), along with reasons for excluding COPCs.

- R2 will provide a risk threshold to CPG to guide the COPC selection in LPR and NB.

- **CFT model partitioning to various carbon phases (EPA Revisions 3b, 4d)**

- a. **Proposed approach to approximate desorption kinetics**

- CPG overviewed desorption kinetics and their importance in CFT modeling.
 - CPG proposed a partitioning framework that accounts for desorption kinetics in a simplified manner.
 - R2 acknowledged the influence of desorption kinetics and had no initial objections to the proposed framework, pending further review of the notes provided by CPG on the day before the meeting.
 - CPG showed preliminary 2378-TCDD and Tetra-CB settings for the new framework that it derived from the hv-CWCM data. R2 questioned the results and the CPG agreed to work with R2 to establish values.
 - [R2 made the point that the algal representation should be spatially varying and improved with monitoring data from the NJ Dischargers Group.](#)
 - **Proposed Action:**
 - R2 will contact the PVSC about obtaining the NJ Harbor Discharger's weekly water quality monitoring data to support algal carbon evaluation.
 - CPG will further analyze the algal carbon to total POC ratio using available data.
 - CPG will provide further details on the derivation of Equation 16 in the partitioning notes provided to R2.

- **CFT model simulation of a fluff layer**

- a. **Consistency between Sediment Transport (ST) and CFT models (EPA Revision 3d)**

- R2 expressed concerns about differences between the ST and CFT fluff layer representation.
 - CPG explained the fluff layer algorithms in the ST and CFT models, and clarified that they are designed to represent different phenomena. The CPG will improve its descriptions of the algorithms to avoid confusion over terminology.
 - CPG showed diagnostics to illustrate the behavior of the CFT model's fluff layer and its goal of capturing recently deposited solids "going up and

down" over a tidal cycle, which is not generally equivalent to the material in the ST model's fluff layer.

- R2 requested additional diagnostics which compare the CFT and ST model's fluff layers for specific cells to facilitate R2's review of the topic. These diagnostics should include periods when the fluff layer conditions are independent of the assigned initial condition.
- CPG explained that a "thickness transfer" is introduced to avoid buildup of stagnant fluff sediment that can equilibrate with underlying sediments.
- R2 suggested considering an alternative approach to move "excess" thickness to the underlying layer for each coupling interval.
- There was additional discussion on the dynamics of the fluff layer and the extent to which it reflects the water column vs. the bed.

b. Parameterization of transfer with parent bed (EPA Revisions 3c, 3e)

- CPG stated that the length scale used in the fluff mixing equation will be changed as R2 suggested, and that this will likely have a minimum impact to the results.
- CPG explained the mixing between the fluff and the underlying layer and agreed to modify the equation to accommodate different composition between the fluff and the underlying layer.
- R2 and CPG disagreed whether the mixing rate between the fluff and the underlying layer should be restricted to values equal to or greater than the mixing rate between the underlying bed layers 1 and 2. This topic will be further discussed during the bioaccumulation model meeting on June 29th.
 - R2 believes similar bioturbation should occur between the fluff layer and the underlying layer.
 - CPG believes the exact mixing process between the fluff layer and the underlying layer is unknown, and will let the calibrated value of the mixing rate guide the interpretation.

• **Proposed Action:**

- CPG will generate detailed diagnostic figures to illustrate the fluff layer behavior on comparisons between computed and measured water column contaminant concentrations (CWCM data) at intra-tidal time scales.

CPG will update the composition in the CFT fluff layer to be consistent with the ST model, and revise the mass transfer formulation accordingly.

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• **Bulk density impact on computed CFT model concentrations (EPA Revision 3f)**

- R2 presented diagnostic charts indicating that the bulk density assigned to a subsurface layer can change and produce unrealistic changes in dry-weight

contaminant concentrations. R2 indicated the FFS/ROD model's use of a fully consolidated bulk density for cohesive solids avoids this artifact.

- CPG stated its interpretation that the artifact is a consequence of the OC model framework and its averaging of ST model computed bulk density into an active layer and an archive layer. The bulk density of an individual layer changes due to changing composition in the active layer, and also when a layer crosses the active and archive layer interface (as demonstrated by the figures presented by R2).
- CPG suggested that the artifact noted by R2 would also occur in the FFS/ROD model.
- [R2 suggested that a potential solution may be to change layer volumes as density changes](#)
- It was decided to further evaluate the importance of this issue by looking into the time trends in 15-cm average concentrations, and to compare the performance of R2's approach to CPG's approach to representing consolidation.
- **Proposed Action:**
 - CPG will provide additional diagnostics to evaluate the top 15-cm average concentrations.
 - CPG will repeat R2's diagnostic using R2's fully consolidated approach in the OC and CFT models to further evaluate this issue.
 - CPG will also assess the extent to which the noted bulk density changes are the result of shifting composition.
- **Rate of recovery in depositional areas (possibility of added carbon to sands)**
 - CPG stated its intent to re-assess recovery in depositional areas after implementing all other changes to the ST/OC/CFT models. If adding carbon to sands is deemed necessary, then options for doing so will be revisited with R2.
 - R2 asked CPG to examine the consistency of the predictions of accumulation of non-cohesive solids in some areas predicted to have high COPC concentrations by CPG's contaminant mapping. R2 walked through a figure from their comments showing a large shift of bed composition from the beginning to the end of a 15-year simulation. CPG responded that this is partially due to the approach of specifying the initial composition in the ST model.
 - **Proposed Action:** CPG will review
 - [Areas with significant sand accumulation in the ST model.](#)
 - [Whether the behavior is influenced by the CFT model, re-initialized for projections](#)
 - The predicted bed composition at the end of WY2010 and its compatibility with the CPG's COPC mapping, once the revised approach is approved by R2.

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- **ST model grain stress partitioning (EPA Revision 1b)**

- R2 informed [the CPG](#) of a minor error in the ST model [initial conditions](#) causing some grid cells along the shoals to be initialized with a D50 of zero. R2 also indicated the skin friction could vary widely if D50 were allowed to change over time in the ST model. R2 provided figures in support of each of these findings.
- CPG responded that the error noted by R2 affected ~8% area and will have a small impact to the results, and so does not require re-calibration. CPG proposed no change to the current approach of keeping the constant D50 over time for computing skin friction. CPG presented several graphics to demonstrate that the current CPG ST model results are highly similar to the FFS/ROD model predictions which do include time-variable D50. Given issues encountered when running the CPG ST model with variable D50, and given the similarity in overall performance between the RI/FS and FFS/ROD models, the CPG's position is that there is little value to be gained in pursuing that option and therefore proposes not to change the current approach.
- R2 will further consider CPG's proposal to not use variable D50 in partitioning grain stress.
- **Proposed Action:** CPG will correct the D50 values by correcting the [model initialization](#) that caused the error.

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- **ST model decoupled mode – issue of changing bathymetry (EPA Revision 1a)**

- CPG proposed no change to the current approach of decoupling the HD and ST model despite the 2-month lag that may occur between bathymetric updates, arguing that the current approach is sufficient because the change in shear stress is insignificant given the bathymetric change differences caused by the decoupling. CPG demonstrated the consistency of shear stresses between model predictions in decoupled model and manual calculations of more frequent bathymetry updating.
- R2 indicated the decoupling between the HD and ST model may be acceptable for simulating baseline conditions, but will need to reflect more frequent bathymetric change in the ST model when simulating dredging without backfill to grade.
 - CPG responded that the model bathymetry is currently set to update at the end of each projection year, but that the updating frequency can be modified.
 - CPG also indicated that including real-time bathymetric change will increase model run time significantly, particularly given that the CPG estimated dredge rate is much slower than R2's.
- R2 will consider CPG's proposal of no change for the RI baseline simulation.

- **Proposed Action:** CPG will update bathymetric change more frequently in the ST model to simulate dredging without backfill to grade (e.g., navigational dredging downstream of RM 1.7).

- **Organic Carbon (OC) model**
 - a. **Comparison to data (EPA Revision 2a)**
 - CPG agreed with R2's position that model-data comparisons for the OC model should be evaluated over the long-term period used for the ST/CFT model calibration.
 - b. **Mass balance (EPA Revision 2b)**
 - CPG agreed to evaluate the mass balance approach moving forward and to adopt it provided that it is able to reproduce data and not cause issues for the CFT model simulations.
 - CPG stressed the importance of reproducing observed bed carbon concentrations so that reasonable carbon-normalized values can be provided to the bioaccumulation model. R2 did not disagree but asked CPG to report on findings if issues with the mass balance approach force the existing fixed fraction organic carbon (f_{oc}) approach to be used as an alternative.
 - **Proposed Action:**
 - CPG will conduct long-term model data comparisons for the OC model.
 - CPG will revert to the mass balance approach agreed to with R2 as part of the OC simplification agreement. However, CPG will switch back to the constant f_{oc} approach if the mass balance approach does not provide reasonable carbon estimates, and document the findings for R2 [including quantification of the carbon mass imbalance introduced by the constant \$f_{oc}\$ approach](#).

- **Representation of Feasibility Study (FS) alternatives in models (Revisions 1c, 2c, 3g)**
 - R2 stressed the need to include solids/carbon/contaminant release, associated [with dredging](#), bathymetric changes and [changes in](#) bed composition [due to capping](#) for the projection simulations, as R2 observed significant differences in their results when incorporating these changes to their simulations.
 - CPG indicated the model is capable of representing these processes and they can be added to future FS simulations. However, CPG expressed concern that implementing real-time bathymetry adjustment will drastically increase the run time and that less frequent updating can be used.

- CPG also proposed to address a potential bias imparted by an “upscaling” issue in future simulations of remedial capping. Because the erosion velocity is computed by the solids flux normalized by the average cohesive solids concentration over the top 15 cm interval, the erosion velocity may be overestimated in capped areas, potentially resulting in an underestimation of post-remedial contaminant concentrations. R2 will give some thought to this issue.
- CPG inquired about the status of R2’s review of CPG’s proposed approach to characterize remedial benefit, which was presented during the April 27 COPC mapping meeting. R2 responded that it is under review.
- **Proposed Action:**
 - CPG will implement dredge release for solids, carbon, and contaminants, more frequent adjustments of bathymetry and include bed composition for caps in the projection simulation.
 - CPG will attempt to address the upscaling concern by using a composition more representative of the near-surface sediments when computing the erosion velocity for the OC and CFT models

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- **Additional Discussion**

- **Comment 552:** R2 expressed its position that when an area is characterized as being hard bottom or shallow sediment in the contaminant mapping, it should also be represented as such in the ST model. CPG agreed conceptually and will review this issue further, and potentially adjust the ST model accordingly.
- **Comment 556:** R2 mentioned the noted discontinuity in the vertical contaminant concentration profiles in the CFT initial conditions for a number of grid cells. CPG provided an initial thought that this discontinuity may be due to a limitation of the algorithm, and indicated that the issue will be revisited once a new surface mapping approach is approved by R2.

Meeting Summary
17-mile RI/FS Modeling Meeting
June 29, 2016
10:00 AM to 3:00 PM

Participants

EPA Region 2

Jennifer LaPoma
Eugenia Naranjo
Alice Yeh
Michael Sivak – by phone
Jonathan Clough (Warren-Pinnacle)
Ed Garland (HDR)
James Wands (HDR)
Scott Kirchner (CDM)
Aaron Frantz (CDM)

CPG

Rob Law (dmi)
John Toll (WW)
Mike Johns (WW)

Introductions/Opening Remarks: There were no opening remarks; group proceeded directly to the bioaccumulation modeling topics on the agenda.

- **Carp ventilation exposure pathway (R2 Comments 569, 578, 582, 591, 602)**
 - CPG presented the newly compiled literature supporting our hypothesis that carp ventilation of HOCs is an important exposure pathway.
 - R2 expressed concern that the carp ventilation uptake coefficient is a calibration variable that is not constrained by empirical data. R2 noted that the use of a carp-ventilation uptake coefficient is an approach that has not been applied at other study areas or in other published bioaccumulation models.
- **Proposed Action:**
 - R2 will review the information CPG presented.
 - R2 and CPG will talk again after R2 has time to review the information CPG presented.
 - CPG will:
 - Use additional PCB homologues or other newly added CFT-modeled COPCs to verify that the carp ventilation uptake coefficient behaves as expected over a range of log K_{ow} values.
 - Provide documentation of previous efforts to calibrate the carp model without the carp ventilation uptake coefficient.
 - Review of carp bioaccumulation modeling for other sites where a ventilation exposure pathway was not included.

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- **Benthic feeding guild biomass (R2 comments 383, 573, 581, 608, 614, 615, 616, 617)**

- CPG provided information about benthic biomass at a number of locations varying along a salinity gradient. Showed that organisms are at the small end of their size ranges under estuarine conditions (true across taxa).
- CPG proposed that Chesapeake Bay dataset is the best available representation of LPRSA organism weights because the individual weights are low and it is the most extensive dataset.
- R2 acknowledged CPG's arguments and proposed a small-group meeting with the Region's benthic expert(s); Jonathan Clough wants to participate.
- **Proposed Action:**
 - Jennifer LaPoma and Rob Law will set up the benthic ecologists' meeting.
 - R2 will share the assumptions and calculations for the benthic biomass by feeding guild figures included in its RI comments.
 - CPG stated that it would share its updated results using soft tissue weights for *Corbicula* spp., and enumerating which data were used in the biomass central tendencies that went into its calculations.
 - CPG stated that it would be willing to put bounds on individual biomass estimates and feeding strategy assumptions.

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- **Bioaccumulation levels in detritivores and deposit feeders (R2 comments 575, 576, 580, 583, 590, 595, 610)**

- CPG asked R2 to provide the data and BSAFs presented in its comments.
- R2 noted that the BSAFs presented were from 2007 Contamination Assessment and Reduction Program (CARP) report "A Model for the Evaluation and Management of Contaminants of Concern in Water, Sediment, and Biota in the NY/NJ Harbor Estuary: Contaminant Fate & Transport & Bioaccumulation Sub-models", and provided John Toll with the data used to generate the BSAFs presented in its comments from the CARP database. The data is available by mail upon request through www.carpweb.org (CPG has the CARP database).
- R2 noted that tissue concentrations in deposit feeders exposed to homogenized 0-15 cm sediment in laboratory bioaccumulation tests are higher than tissue concentrations in carp. R2 asked CPG to consider why this is so.
- R2 asked CPG to "look at the *Nereis virens* bioaccumulation test data and think about why the BSAF is so low."
- R2 noted that the CPG calibration for bottom-sediment feeding invertebrates provides BSAFs that are higher than literature estimates, the CARP data cited above, and the bioaccumulation test data. CPG agreed to calibrate this portion of the model to produce a lower BSAF.
- **Proposed Action:**
 - R2 will provide CPG with J. Clough's BSAF calculations
 - J. Toll will review the CARP data and report on findings

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Correction – CPG has confirmed that R2's BSAFs are from the

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- CPG will include a non-zero sediment component in the diet of detritivores

- CPG to consider the following:

- Conducting an independent review of the CARP dataset.
- Independently reanalyzing the CARP dataset to check R2's BSAF calculations.
- Re-evaluating R2's draft RI comments re: bioaccumulation levels in detritivores and deposit feeders after it completes its review and reanalysis of the CARP data.
- Reviewing the *Nereis virens* bioaccumulation test data.

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• Questions regarding additional bioaccumulation model parameters/functions

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• J. Clough raised a question about the discontinuity in growth allometrics. John Toll responded that they had asked Arnot about the source of the discontinuity, but didn't get a satisfactory answer.

• J. Toll asked for guidance from Jonathan Clough on absorption efficiency.

• **Approach to passing data from the CFT model to the bioaccumulation model (R2 comments 586, 592, 611, 612)**

- CPG and R2 briefly discussed updates that will be made to the CPG's CFT model (specifically to the OC model) that affect chemical partitioning in the water column.
- R2 asked the CPG to update the bioaccumulation model to ensure consistency with the updated CFT model.
 - CPG and R2 discussed three ways that CPG could update the bioaccumulation model to ensure consistency with the updated CFT model.
 - R2 indicated that any of the three ways that that CPG could update the bioaccumulation model would be acceptable as long as the results are consistent with the updated CFT model.

• **Proposed Action:**

- CPG will use information for DOC and algae from the CFT, although J. Toll expressed concern about consistency between the CFT model and Gobas model

- CPG will evaluate sensitivity to whether partitioning equations are applied in the CFT or bioaccumulation model

- CPG will update the bioaccumulation model to ensure consistency with the updated CFT model.

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- **Modeling detritus & sediment exposure depth (R2 comments 570, 571, 572, 599, 611)**

- CPG acknowledged receipt of the dispute resolution letter.
- No further discussion
- Proposed Action: CPG to use the 15 cm average concentration from the CFT model as the sediment exposure concentration in the bioaccumulation model.

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- **Recalibration**

- a. **Spatial scale (R2 comments 408, 574, 577, 579, 594, 597, 600, 601, 603, 613)**

- CPG sought clarification on how R2 used the term calibration in its comments.
 - i. R2 clarified that it broadly used the term calibration to refer to the entire model calibration process, including model corroboration/verification.
 - ii. R2 clarified that when it told CPG to use data for calibration, it meant to use the data in the broadly defined calibration process (but not necessarily as calibration data).
- CPG sought clarification on R2's reasons for calibrating at a finer spatial scale and how it made tradeoffs between finer spatial resolution and higher uncertainty associated with the smaller calibration datasets. J. Toll indicated that they would have to do sensitivity analyses to set boundaries for spatially segregating data. R2 suggested using raw tissue data to examine spatial patterns, rather than summary statistics in pre-determined spatial bins. CPG indicated that spatial distribution of tissue and sediment data will be reviewed.
- R2 asked CPG to consider recalculating whole body tissue concentrations from fillet samples using site-specific fillet-whole body tissue concentration ratios. CPG offered no objections and offered to consider it.
- CPG described an approach for calibrating and verifying the model at a finer spatial scale. R2 considered CPG's proposed approach reasonable, and will review the CPG's approach for splitting out the samples into finer spatial bins once it is provided.

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- b. **Trophic guilds (R2 comments 384, 409, 568, 584, 585, 587, 592, 596, 604, 618)**

- CPG confirmed that R2's comments about including trophic guilds in calibration meant using the data in the broadly defined calibration process (but not necessarily as calibration data).
- R2 to reconsider whether small eel needs to be modeled separately, taking into account the importance of small eel as a prey species in the LPRSA.

- c. **Temporal issues (R2 comments 588, 593, 605)**

- CPG will refine the temporal correlation between bioaccumulation model inputs and tissue concentration data collection. CPG will remove Hurricane Irene from the model calibration period and will focus on the times of year when tissue data were collected.

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- CPG to check with Jon Arnot and Frank Gobas to find out whether they've made improvements to the temperature-dependent growth rate equations (equations 22 and 23) in their model (Arnot and Gobas 2004).
 - CPG will incorporate additional tissue concentration data into the broadly defined calibration process.
- d. **Sensitivity & uncertainty analysis (R2 comments 598, 606, 607)**
- R2 asked CPG to do test runs with the recalibrated model to see how rapidly depuration is predicted to occur if chemical concentration inputs are abruptly set to zero.
 - R2 asked CPG to run projections with alternative model recalibrations, as a way to examine sensitivity of remedial alternatives to modeling uncertainties.
 - CPG offered no objections and offered to perform R2's sensitivity & uncertainty analysis requests.
- **Proposed Action (Recalibration):**
- R2 to consider whether small eel needs to be included in the bioaccumulation model or not, taking into consideration its importance as prey in the LPRSA food web.
 - R2 will provide CPG with Kevin Farley's BSAF analysis (NY Harbor worms)
 - CPG will do the following:
 - Update the link between the CFT-OC model and the bioaccumulation model, after the revised CFT-OC model has been completed.
 - Recalculate whole body tissue concentrations from fillet samples using site-specific fillet-whole body tissue concentration ratios.
 - Recalibrate the bioaccumulation model after the CFT model is recalibrated.
 - Recalibrate the bioaccumulation model with greater spatial and temporal resolution using some data for calibrating and other data for testing and verifying the model.
 - Include other chemicals modeled with the CFT model in the bioaccumulation model recalibration.
 - Analyze sensitivity of remedy effectiveness (for all remedial action alternatives) to bioaccumulation model uncertainties.
 - CPG will evaluate using a different mix of prey fractions (where model inputs differ from catch data). CPG will consider effect on calibration if changes are made to adopt nominal prey fractions.
 - CPG will include non-zero fraction of deposit feeders in catfish diets
 - CPG will include small forage fish as calibration targets (previously they had been used for validation)

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References

Arnot JA, Gobas FAPC. 2004. A food web bioaccumulation model for organic chemicals in aquatic ecosystems. *Environ Toxicol Chem* 23:2343-2355.